

REMARKS

Claims 1-20 are currently pending in the application. By this amendment, claim 1 is amended and replacement Figure 5 and new Figure 7 will have been entered for consideration by the Examiner. The above amendments do not add new matter to the application and are fully supported by the specification as noted below. Reconsideration of the rejected claims in view of the above amendments and the following remarks is respectfully requested.

Summary of the Official Action

In the instant Office Action, the Examiner has objected to drawings, rejected claims 1 – 20 as being directed to non-statutory subject matter, and rejected claims 14 – 18 based upon formal matter. Further, claims 1 – 13, 19, and 20 have been rejected over the art of record. By the present amendment and remarks, Applicants submit that the objections and rejections have been overcome, and respectfully request reconsideration of the outstanding Office Action and allowance of the present application.

Support for Amendments

Applicants submit the amendments to the specification and claims find explicit support in the original disclosure. The new paragraph entered into the specification describes new Figure 7, which has been submitted to address the Examiner's objection that the recited features of claims 14 – 18 were not illustrated. Therefore, the text associated with new Figure 7 finds support in claims 14 – 18. Moreover, the first and second full paragraphs on page 9 (between lines 11 – 25) of the specification describe element subdivision or recursive subdivision (111), which can be of a batch of elements or a single element. An example of such subdivision is illustrated in Figure 5, and this subdividing can include strategic subdivision features or use breadth of use strategy, as described in the specification, which is illustrated in new Figure 7.

With regard to independent claim 1, the instant amendment finds support in the bridging paragraph of pages 7 and 8 of the original disclosure (“... and the DOF values are stored as DOF data, and treated as non-static values subject to later updating.”).

Accordingly, Applicants submit that the instant amendment is proper and fully supported

by the original disclosure.

Drawing Objection is Moot

Applicants submit that the drawing objection under 37 C.F.R. 1.83(a) for failing to illustrate the features of claim 14 – 18 is moot. Concurrently herewith, Applicants are submitting new Figure 7, which illustrates the features recited in at least claims 14 – 18, and finds support in the noted claims, as well as the first and second full paragraphs (lines 11 – 25) on page 9 of the specification, as discussed above. As new Figure 7 is supported by the original disclosure, Applicants submit that no question of new matter is raised in entering new Figure 7.

Applicants further note that replacement Figure 5 has been submitted to include reference numeral 127, which is discussed in the originally submitted disclosure. Accordingly, entry of the replacement sheet containing Figure 5 is requested.

***Traversal of Rejection
Under 35 U.S.C. §101***

Applicants traverse the Examiner's rejection of claims 1 – 20 under 35 U.S.C. §101 as being directed to non-statutory subject matter. In particular, the Examiner asserts that independent claim 1 recites a dynamic directory that is not tangibly embodied and that independent claims 3, 14, and 19 recite tetrahedralization by abstract steps performed without hardware. Applicants traverse the Examiner's assertions.

By the instant amendment, Applicants have amended independent claim 1 to clarify that the recited dynamic directory is stored on a computer readable medium, which finds support in the bridging paragraph of pages 7 and 8 of the original disclosure (“... and the DOF values are stored as DOF data, and treated as non-static values subject to later updating.”). Accordingly, Applicants submit that the invention recited in amended independent claim 1 is patentable subject matter. Moreover, as Applicants' original disclosure sets forth the manner in which the DOF stored in the dynamic directory is utilized to tetrahedralize a non-conformal mixed-element mesh, Applicants submit that the invention produces a “useful, concrete and tangible result,” in accordance with *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368, 1374, 47 USPQ2d 1596, 1601-02 (Fed. Cir. 1998).

With regard to independent claims 3 and 19, Applicants submit that these claims are method claims which positively recite “providing a non-conformal mixed element mesh comprising elements subdividable into tetrahedral,” identifying (or generating data defining) “respective degree of freedom values for the elements in the mesh” and “performing element subdivision based on the degree of freedom values of the elements in the mesh.” Applicants submit that, as these positively recited features are actions rather than a mere a manipulation of abstract ideas or mathematical constructs, claims 3 and 19 are likewise patentable subject matter. Moreover, as the recited methods result in a tetrahedralized non-conformal mixed element mesh, the invention recited in these claims produces a “useful, concrete and tangible result.” See *id.*

With regard to independent claim 14, Applicants submit that this claim is directed to a tetrahedralizing filter composed of a number of recited elements. As this claim recites structural features of the invention, Applicants submit that this claim contains patentable subject matter. Moreover, as the recited methods result in a tetrahedralized non-conformal mixed element mesh, the invention recited in these claims produces a “useful, concrete and tangible result.” See *id.*

Accordingly, Applicants submit that each of claims 1 – 20 are drawn to statutory subject matter, and thus are fully in compliance with the requirements of 35 U.S.C. §101. Therefore, Applicants request that the Examiner reconsider and withdraw the rejection of claims 1 – 20 and indicate that these claims are directed to patentable subject matter.

***Traversal of Rejection Under
35 U.S.C. §112, First Paragraph***

1. Enablement

Applicants traverse the rejection of claims 14 – 18 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. In particular, the Examiner asserts that the original disclosure fails to provide sufficient teaching to enable one ordinarily skilled in the art to realize the claimed receiver, processor, or element subdivider. Applicants traverse the Examiner’s assertions.

Contrary to the Examiner’s assertions, Applicants submit that one ordinarily skilled in the art reviewing the original disclosure and the pending claims would readily be able to make and use the instant invention. In particular, the original specification, and in particular, Figures 4 – 6, disclose the operational functionality required for each structural element in order to practice the

invention recited in claims 14 – 18, and the Examiner has not shown that the specification is deficient in this regard.

Moreover, Applicants note that the amendment to the specification even more clearly presents the subject matter of claims 14 – 18 in such a manner that one ordinarily skilled in the art would be readily able to make and use the invention recited in claims 14 – 18.

Accordingly, Applicants submit that the original disclosure is fully in compliance with the requirements of 35 U.S.C. §112, first paragraph, and request that the Examiner reconsider and withdraw the formal rejection of claims 14 – 18, as these claims recite subject matter fully enabled by the original disclosure.

2. Single Means

Applicants traverse the rejection of claims 1 and 2 under 35 U.S.C. §112, first paragraph, as based on a single means, and therefore nonenabling for the scope of the claim.

Applicants note that the prohibition against single means claims is to prevent a claim that covers every conceivable means for achieving the stated result, which may be more than that known by the inventor. A similar prohibition has been held where a claim covers every conceivable means for achieving a stated property. However, contrary to the Examiner's assertions, Applicants note that, as pending claims 1 and 2 recite a single element not a "single means," these claims are not "means claims," as asserted by the Examiner, i.e., claims reciting a means to produce a particular result or achieve a stated property. Therefore, Applicants submit that the instant formal rejection is inapplicable and should be withdrawn.

In contrast to a single means claim that claims every conceivable means for producing a result or achieving a property, the instant claims recite a single element, for which there is no prohibition under 35 U.S.C. §112, first paragraph, for nonenablement. While such a claim may be admittedly broad, undue breadth of a claim is determined from the prior art not the formal requirements of 35 U.S.C. §112, first paragraph.

Accordingly, Applicants request that the Examiner reconsider and withdraw the rejection of claims 1 and 2 under 35 U.S.C. §112, first paragraph, and indicate that these claims are fully in compliance with requirements of the statute.

Traversal of Rejection Under 35 U.S.C. §103(a)

1. Over Albertelli in view of Chazelle

Applicants traverse the rejection of claims 1 and 2 under 35 U.S.C. §103(a) as being unpatentable over ALBERTELLI (“Efficient Subdivision of Finite-Element Datasets into Consistent Tetrahedra”) in view of CHAZELLE (“Bounds on the Size of Tetrahedralizations”). The Examiner asserts that, while ALBERTELLI does not disclose minimizing Steiner points using a dynamic directory of degree of freedom values during tetrahedralization, it would have been obvious to modify ALBERTELLI to include such a device in view of CHAZELLE’s teaching of dynamically checking for the addition of Steiner points during tetrahedralization by reducing to the lowest value for the degrees of freedom.

Applicants’ independent claim 1, as currently amended, recites, *inter alia*, a respective degree of freedom value *is stored* for each element, wherein the degree of freedom value is current as element subdivision proceeds. Applicants submit that no proper combination of ALBERTELLI and CHAZELLE teaches or suggests at least the above-noted feature.

Applicants note that, while CHAZELLE uses the phrase “degree of freedom,” neither ALBERTELLI nor CHAZELLE teach the requisite motivation or rationale for modifying ALBERTELLI in the manner asserted by the Examiner. In particular, the Examiner has not pointed to any teaching in the applied art that even arguably suggests to one ordinarily skilled in the art to modify ALBERTELLI to utilize the degree of freedom disclosed by CHAZELLE, nor is there any suggestion in the applied art as to how or why one ordinarily skilled in the art would modify ALBERTELLI in view of CHAZELLE in the manner asserted by the Examiner.

Further Applicants note that the instant invention is directed to tetrahedralization of an initially constrained mixed element mesh, whereas CHAZELLE is directed to tetrahedralization of an initially unconstrained meshing. Moreover, as CHAZELLE fails to teach or suggest utilizing the concept of degree of freedom to tetrahedralize an initially constrained mixed element mesh, Applicants submit that no proper combination of ALBERTELLI and CHAZELLE can even arguably render unpatentable the instant invention.

Moreover, Applicants note that neither ALBERTELLI nor CHAZELLE teach or suggest that a respective degree of freedom value *is stored* for each element, wherein the degree of freedom value is current as element subdivision proceeds, as recited in at least independent claim

1, as now amended.

As neither applied document teaches or suggests at least the above-noted feature of at least independent claim 1, Applicants submit that no proper combination of these documents can render unpatentable the combination of features recited in the pending claims.

Further, Applicant submits that claim 2 is allowable at least for the reason that it depends from an allowable base claim and because it recites additional features that further define the present invention.

Accordingly, Applicants request that the Examiner reconsider and withdraw the rejection of claims 1 and 2, and indicate that these claims are allowable.

2. Over Albertelli in view of Chazelle and further in view of Bonneau

Applicants traverse the rejection of claims 3 – 12, 19, and 20 under 35 U.S.C. §103(a) as being unpatentable over ALBERTELLI in view of CHAZELLE and further in view of BONNEAU (“Polyhedral Modeling”). The Examiner asserts that, while ALBERTELLI does not disclose minimizing Steiner points using a dynamic directory of degree of freedom values during tetrahedralization or performing mesh element subdivision based on degree of freedom values of the elements, it would have been obvious to modify ALBERTELLI to include CHAZELLE’s teaching of dynamically checking for the addition of Steiner points during tetrahedralization by reducing to the lowest value for the degrees of freedom and it would have been obvious to modify ALBERTELLI to include BONNEAU’s teaching of subdividing mesh elements based on the degree of freedom values of the elements.

Applicants’ independent claim 3 recites, *inter alia*, providing a non-conformal mixed element mesh comprising elements subdividable into tetrahedra, and identifying respective degree of freedom values for the elements in the mesh, and performing element subdivision based on the degree of freedom values of elements in the mesh. Further, independent claim 19 recites, *inter alia*, providing a non-conformal mixed element mesh comprising elements subdividable into tetrahedra, and generating data defining respective degree of freedom values for the elements in the mesh, and performing element subdivision based on the degree of freedom values of elements in the mesh, wherein the degree of freedom data is dynamically updated. Applicants submit that no proper combination of ALBERTELLI, CHAZELLE, and

BONNEAU teaches or suggests at least the above-noted feature.

Applicants note that, while CHAZELLE uses the phrase “degree of freedom,” neither ALBERTELLI nor CHAZELLE teach the requisite motivation or rationale for modifying ALBERTELLI in the manner asserted by the Examiner. In particular, the Examiner has not pointed to any teaching in the applied art that even arguably suggests to one ordinarily skilled in the art to modify ALBERTELLI to utilize the degree of freedom disclosed by CHAZELLE, nor is there any teaching or suggestion in the art of record as to how or why one ordinarily skilled in the art would modify ALBERTELLI in view of CHAZELLE in the manner asserted by the Examiner.

In a similar manner, Applicants note that, while BONNEAU, too, uses the phrase “degree of freedom,” this document fails to provide any teaching or suggestion for utilizing this degree of freedom for tetrahedralization, as taught by ALBERTELLI. In fact, Applicants note that in contrast to both ALBERTELLI and CHAZELLE, BONNEAU utilizes the concept of degree of freedom to obtain triangulation of surfaces. Because BONNEAU is directed subject matter distinct from both ALBERTELLI and CHAZELLE, Applicants further submit that the art of record fails to disclose the requisite motivation or rationale for modifying ALBERTELLI (with or without CHAZELLE) in view of BONNEAU in the manner asserted by the Examiner.

Moreover, Applicants submit that the Examiner has not pointed to any teaching in the applied art that even arguably suggests to one ordinarily skilled in the art that it would have been obvious to modify ALBERTELLI to utilize the noted teachings of CHAZELLE and BONNEAU or how or why it would have been obvious to modify ALBERTELLI to include these features.

As the art of record fails to provide the necessary motivation or rationale for combining the documents in the manner asserted by the Examiner, Applicants submit that no proper combination of these documents can render unpatentable the combination of features recited in at least independent claims 3 and 19.

Further, Applicant submits that claim 4 – 12 and 20 are allowable at least for the reason that these claims depend from allowable base claims and because these claims recite additional features that further define the present invention.

Accordingly, Applicants request that the Examiner reconsider and withdraw the rejection of claims 3 – 12, 19, and 20, and indicate that these claims are allowable.

***Request for Examination
on the Merits of Claims 14 – 18***

For the reasons set forth above, Applicants submit that the claims 14 – 18, as originally presented, were sufficiently clear and unambiguous so that an examination on the merits of these claims should have been made by the Examiner in the instant Office Action. As the Examiner did not examine claims 14 – 18, Applicants now request such examination and note that, as the merits of these claims should have been, but were not, treated in the first office action, the next Official Action cannot be made final.

Application is Allowable

Thus, Applicants respectfully submit that each and every pending claim of the present invention meets the requirements for patentability under 35 U.S.C. §§ 102 and 103, and respectfully request the Examiner to indicate allowance of each and every pending claim of the present invention.

CONCLUSION

In view of the foregoing, it is submitted that none of the references of record, either taken alone or in any proper combination thereof, anticipate or render obvious the Applicants' invention, as recited in each of claims 1 – 20. The claims have been amended to eliminate any arguable basis for rejection under 35 U.S.C. § 112. In addition, the applied references of record have been discussed and distinguished, while significant claimed features of the present invention have been pointed out.

Further, any amendments to the claims which have been made in this response and which have not been specifically noted to overcome a rejection based upon the prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto. Accordingly, reconsideration of the outstanding Office Action and allowance of the present application and all the claims therein are respectfully requested and now believed to be appropriate.

Respectfully submitted,
Stephen E. FISCHER et al.

A handwritten signature in black ink, appearing to read 'Andrew M. Calderon', with a large, stylized loop at the end.

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Appendix: 2 Replacement Sheets

AMENDMENT TO DRAWINGS

The sheets of drawings attached as part of the Appendix includes replacement Figure 5 and new Figure 7. Replacement Figure includes an amendment to include reference numeral "127," while Figure 7 has been submitted to address the Examiner's objection under 37 C.F.R. 1.83(a).